WBS 6.05.04.01
Low Voltage Power Supply Production

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UT Arlington

Director's Review Practice Talk for:
NSF pre-PDR Review

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L3 Manager, CAM

- Haleh Hadavand Assistant Professor of Physics UT Arlington, TX
- Member of ATLAS since 2005
- Extensive work on commissioning and monitoring of LAr with cosmics as well as calorimeter cluster monitoring
- Developed Data Quality monitoring framework
- CaloGlobal and Jet monitoring contact

UT Arlington

- Physics
  - Faculty: *Haleh Hadavand(LVPS), Andrew Brandt (LVPS)*, Andy White (ITC), Kaushik De (PPr)
  - Guilio Usai, Research Assistant Professor
  - undergraduate students
- Engineering
  - Faculty: Ali Davoudi
  - Electrical Associate: Seyedali Moyadi
  - Electrical Technician: Michael Hubbard

Low Voltage Power Supply

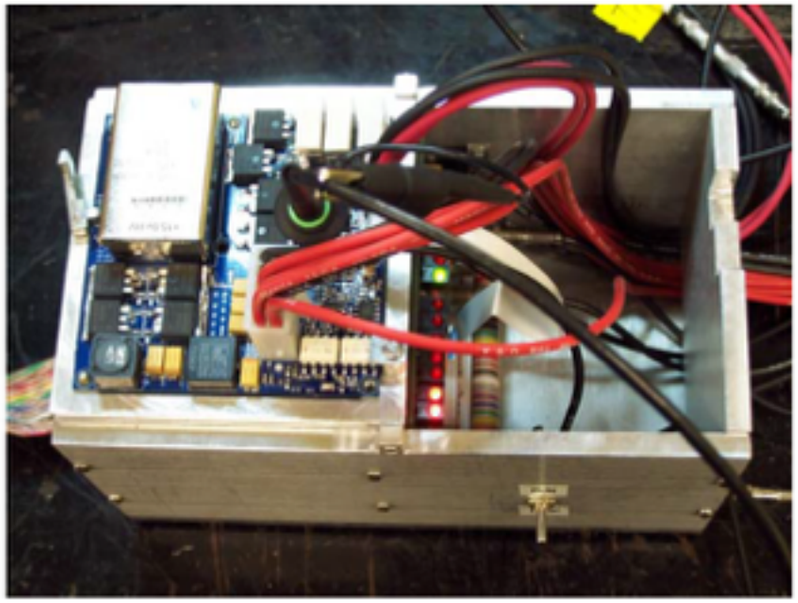


Figure 5. Picture of a brick test fixture

Figure 8. Close-up view showing connectivity of a brick in the Burn-in Station

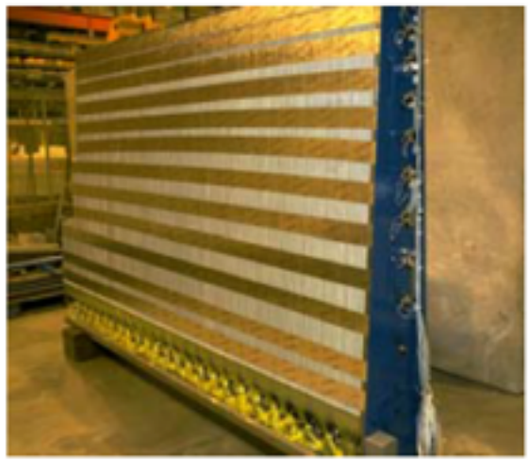


Fig. 1. TileCal Module

Fig. 2. Electronics drawer

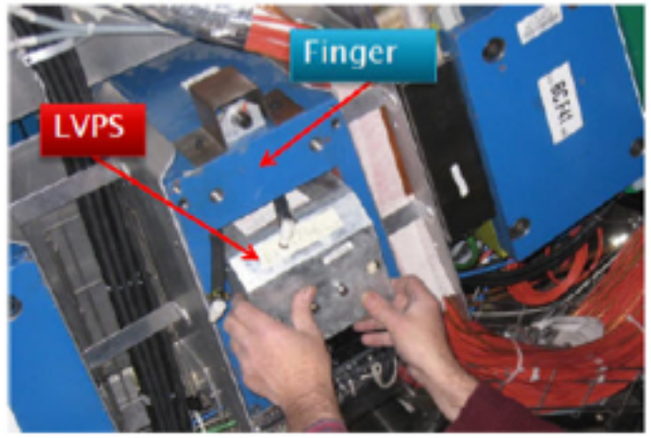
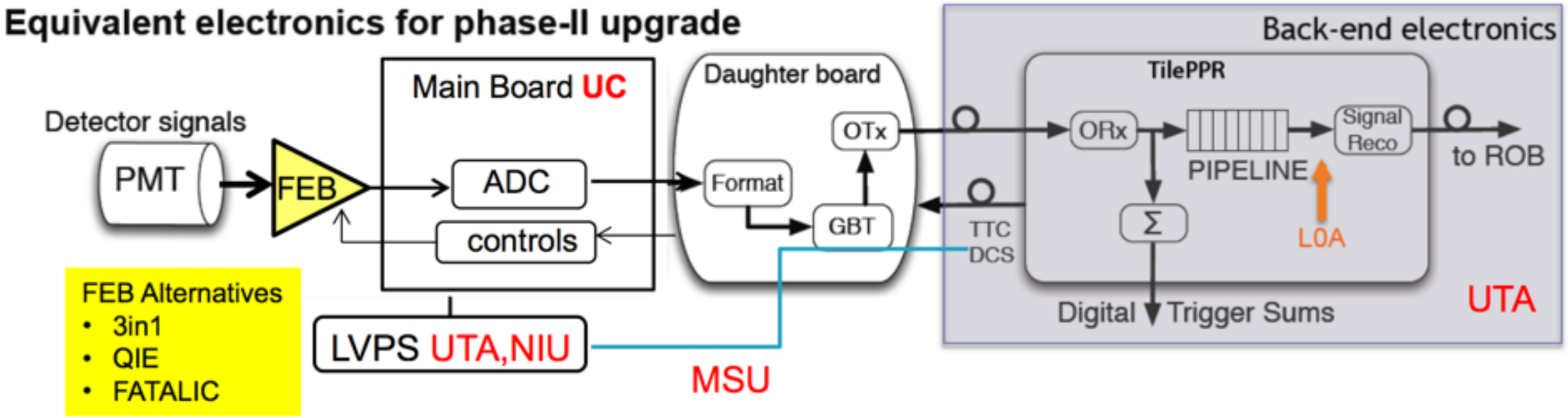


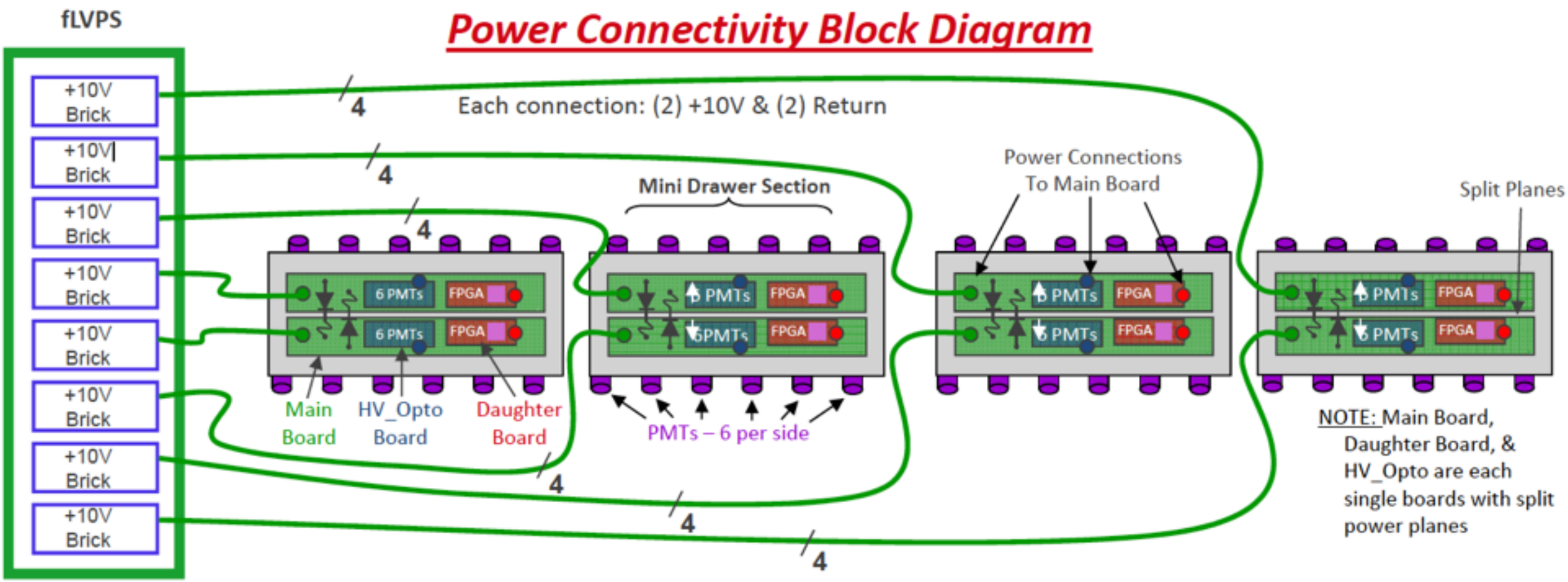
Fig. 3. LVPS mounted on module

Deliverable 1024 Low Voltage Power Supplies

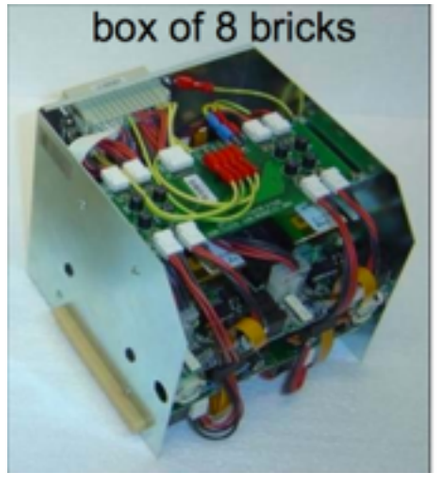


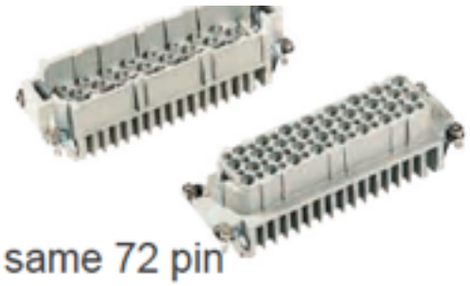
- 3-in-1 Front-end boards: Shaping of PMT signals for digitization, calibration and luminosity monitoring
- Main board: Digitize shaped PMT pulses, control attached 3-in-1 Front-end boards
- Daughter board: High speed link to the off-detector electronics for commands, On-detector monitoring / control and LHC clock extraction and distribution
- PPR: Off detector data stored in pipeline for trigger decision, interface to DAQ, and DCS

Power Connectivity



LVPS Box





Use same 72 pin
Harting Connector

LVPS Box

8 Bricks/Box

200V
Dist.
Board

200 VDC
8

+10V & Returns
4

+10V
Brick

Ground
6

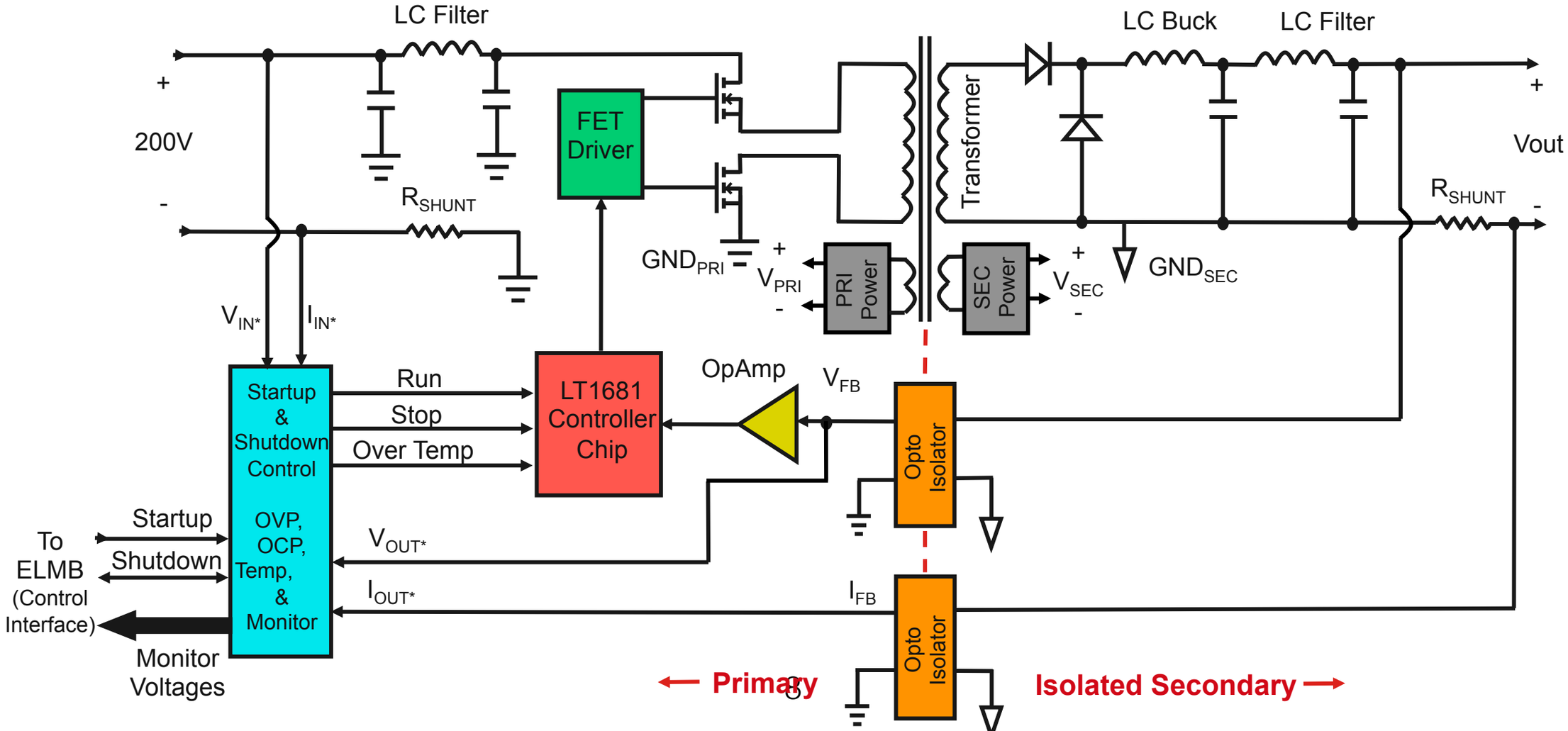
Control
Board

Control &
Monitoring

Range of Voltages: 1:1 ⇨ One Brick Design
Range of Currents: ~2:1 * ⇨ Factor of 2 for redundancy

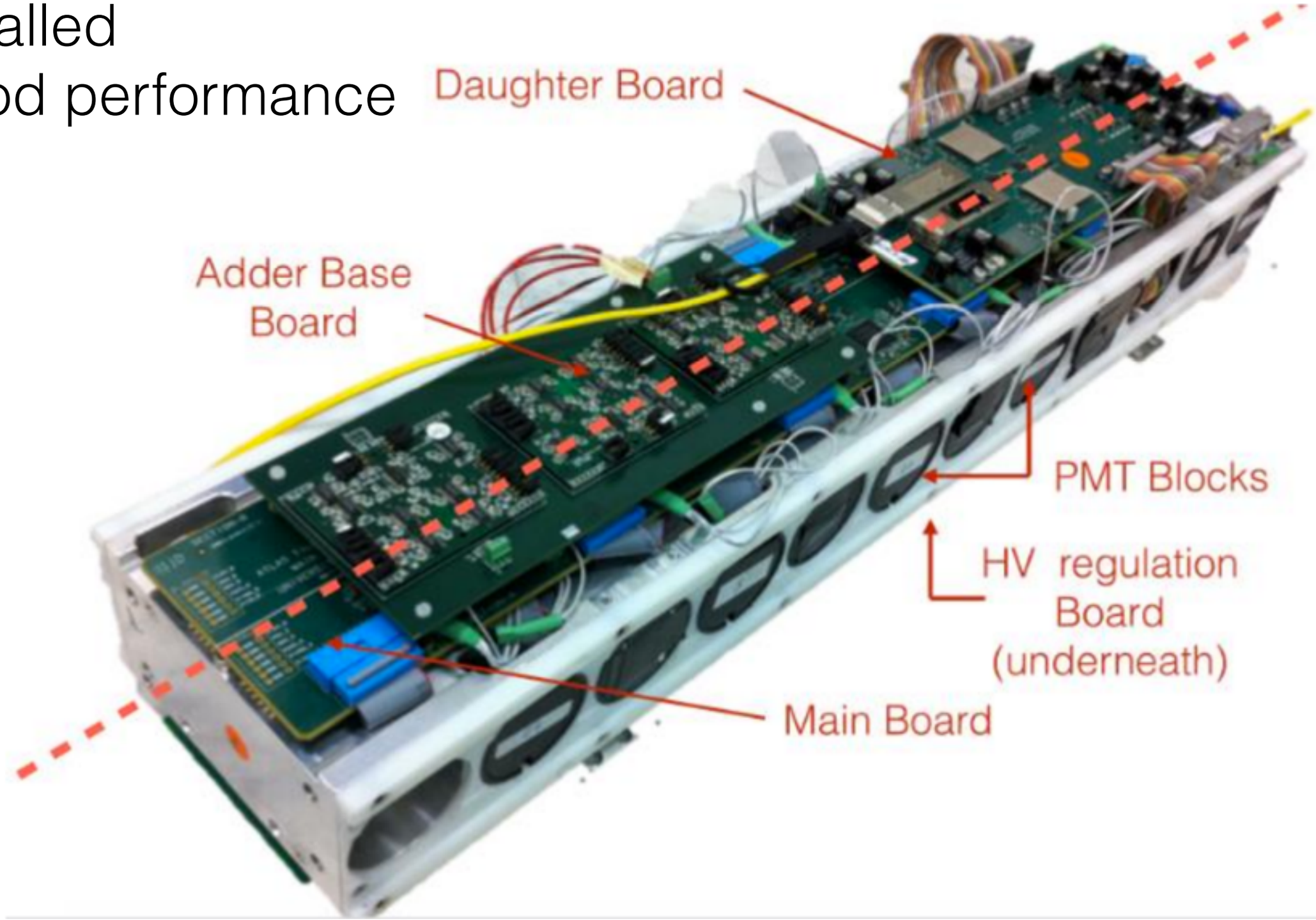
LVPS Schematic

- Buck Convertor with transformer
- Controller chip operates at 300 kHZ
- 10-30% Duty cycle
- transformer winding of 14:2
- Vout 10 V, 7 A nominal, 14 A redundancy, 11A over voltage protection



Demonstrator

Version 8.0.8
installed
Good performance



Changes Since CDR

- The design of the burn-in station is now part of task list

Cost of Materials

	N=30	N=100	N=1024	N=1200
Stock Parts	$4,500	$12,000	$89,000	$104,000
Transformers	$10,500	$25,000	$81,000	$95,000
Thermal posts	$2,400	$7,000	$62,000	$61,000
PCB Fabrication	$1,600	$2,000	$6,000	$7,000
PCB Assembly	$9,500	$19,000	$97,000	$114,000
Totals	**$28,500**	**$64,000**	**$335,000**	**$381,000**

Table 1 Brick Procurement M&S as a function of number of bricks.

- Costs based on BOM received from vendors a few months ago
- The rates are based on quantity purchase at given time
- Use vendors already used for earlier versions of LVPS
  - Good relationship and experience

Labor Costs

- Main person overseeing the LVPS project is the Electrical Technician with oversight from Electrical engineer

- The Electrical Assistant is an EE PhD student (uncosted till Jan 2018)

  - Responsible for the design of a new burn-in-station

- During the pre-production and production we will use EE and EA to fix broken boards and graduate and undergraduate students for QA tasks (checkout and burn-in)

Labor Costs by Project Phase

Cost Table by Project Phase

Overview of Tasks

Project phases:

- Design Phase (R&D) & Pre-Production
- Production (MREFC)

We are to deliver all 1024 LVPS needed

Production consists of:

- assembly of LVPS
- quality testing and documentation
- repair of defective boards
- shipping of bricks to NIU to put into boxes

There will be Pre-production run of 100 LVPS

- establishes the production process, qualifies vendors
- ~100 boards produced will be used as shelf-spares

Design Phase

- The LVPS will go through minimal design changes in 2017
- A new burn-in-station will be designed by EA
- Another version after ELMB++ interface fixed and radiation testing
- During the design phase will also purchase and validate test stands
- Radiation testing to occur in mid-late 2019
    - According to results might need to design change

Pre-Production

- Pre-production of 100 boards to happen in April-December 2020

- This run is used to prepare of production helping to determine defect rate, establish connection with vendors, and train students in the process

Production

- Production of 1024 boars to happen in Jan-2021-February 2022
- This steps in production include procurement of parts which are then inspected in house before they are send to PCB assembly vendor
- Each brick is gone through QA and burn-in
    - This work will be done mainly by EA and undergraduate students
    - EE and EA will repair broken bricks and use 5% as spares
- After QA bricks are shipped to NIU where they are put into boxes of 8

Risk